NEW FISHES OF THE FAMILIES DACTYLOSCOPIDAE, MICRODESMIDAE, AND ANTENNARIIDAE

From the West Coast of Mexico and the Galapagos Islands

WITH A BRIEF ACCOUNT OF THE USE OF ROTENONE FISH POISONS IN ICHTHYOLOGICAL COLLECTING

(Plates 20-23)

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This is the fourth of a series of papers[1] on the fishes obtained by the senior author while serving as ichthyologist of the 1938 Hancock Pacific Expedition cruise in Eastern Pacific waters. Under the command of Captain Allan Hancock, the expedition, aboard the motor cruiser *Velero III,* sailed for the Galapagos Islands and the west coast of South America January 2, 1938, and returned to the United States some two and one-half months later. Although most of the collections were made at the Galapagos Islands and along the coasts of Peru, Ecuador, and Colombia, dredging and other stations were also established along the west coasts of Mexico and Central America, where several new forms were taken. (See Fraser, 1943, a, b, and c.)

A new genus and species of the family Dactyloscopidae, *Heteristius jalisconis,* is described in this paper, as well as three other new species of the same family, *Dactyloscopus elongatus, Myxodagnus sagitta,* and *Cokeridia lactea.* A new species of the family Microdesmidae, *Microdesmus reidi,* is described, as is a new Antennariid, *Antennarius ziesenhennei.*

In the list of specimens at the beginning of each description AHF refers to the catalogue numbers in the ichthyological collections of the Allan Hancock Foundation. All holotypes are in the collection of the Allan Hancock Foundation. When there is more than one paratype, one or more paratypes have been deposited in the collection of the Natural History Museum of Stanford University, where this paper was prepared.

The drawings were made by Pascual Ortiz. Although Mr. Ortiz has caught the general appearance of the fishes very well, there are, unfortunately, various inaccuracies in the illustrations. In those instances in which the description disagrees with the drawing, the description may be accepted as the more correct of the two.

[1] The previous reports of this series are all in the present volume of *Allan Hancock Pacific Expeditions,* as follows: no. 3, 1940 (Herald: Syngnathids); no. 4, 1941 (Myers and Wade, New eels); and no. 5, 1942 (Myers and Wade: Atherinids).

USE OF ROTENONE FISH POISONS

In our paper on Atherinids (Allan Hancock Pacific Expeditions, vol. 9, no. 5) we have given notes on one effective method of marine ichtyological collecting, the use of the electric light in night collecting from the ship. We now present an even more useful method.

Some of the fishes described below were obtained by the use of vegetable "fish" poisons, which are perhaps the most useful of all tools to the ichthyological collector. Although the aborigines of most parts of the world use plant juices of many kinds to stupefy and kill fish to eat, the general use of fish poisons by the scientific fish collector is a relatively recent development. Probably the first ichthyologist to use fish poisons regularly was the late David Starr Jordan, and it is largely to this method that we may attribute the hitherto almost unheard of variety of small fishes he and his students obtained in Japan, Samoa, and other Pacific localities. Jordan usually used chloride of lime, and the method is mentioned in his *Guide to the Study of Fishes* (1905). The late Dr. Carl H. Eigenmann was apparently the first ichthyologist who made regular use of native vegetable fish poisons, and his classical account of his first results, in the introduction to his *Freshwater Fishes of British Guiana* (1912), should be read by every ichthyological collector. As a matter of fact, it was Eigenmann, and his student, Dr. William Ray Allen, who first suggested the importation of the dried roots of fish poison plants into the United States as an insecticide, the story having recently been published in their *Fishes of Western South America* (1942). The subsequent immense growth of the commerce in the roots both of the Asiatic *Derris elliptica* and of various tropical American fish poison plants (called *timbó* in Brazil, *barbasco* or *cubé* in Peru), for use in insecticides, provides the scientific fish collector with a ready means of supply. The first use of the commercial product was made by Dr. Carl L. Hubbs. The literature of economic entomology now abounds with papers on the various rotenone poisons. In addition to those given by Eigenmann and Allen (1942), we give only one (Holman, 1940) which, incidentally, mentions Allen's work in Peru.

The active principle in these roots is said to be rotenone, but Dr. A. W. Herre tells the senior author that one of the chemists of the Bureau of Science in Manila found other and even more potent piscicidal elements in derris root. In any event, the action on the fish is one of suffocation, a prevention of exchange of oxygen in the gills, and the gill filaments in derris-killed fish are of a peculiar bright red color. The "poison" does

not in the least affect the edibility of the fish killed, nor is a concentration lethal to fish poisonous to terrestrial vertebrate animals, including man, which drink the water. Moreover, organic decay destroys the effect of the derris after a few days. The dust of powdered derris does, however, have a very irritating and narcotic effect on the mucous membranes of the eyes, mouth, and nasal passages, and the user must exercise some care. Most of these remarks apply equally to the South American *timbó,* which is also now loosely called derris or "rotenone."

The senior author took a supply of both *timbó* and derris (powdered root, 5% rotenone content) on the 1938 cruise. These were put up before the trip in small cellophane sacks, three of which could be packed together in a watertight one-pound coffee tin. The cellophane and tins protected the powder sufficiently from damp, which quickly ruins the potency of the powder. One or more of the tins was taken ashore at each collecting place.

The powder was used as follows: After selecting a tide pool of reasonable size, the sacks were taken from the tin and the contents of one sack was dumped into the tin with some water and shaken vigorously until the mixture was of the consistency of thin, smooth, liquid mud. This was poured into the pool and stirred into all its recesses. Fish soon began to wobble and gyrate. If no effect was seen within a few minutes, another sack was used. One one-third pound sack was usually sufficient for a tide pool approximately 12 by 6 feet and two feet deep, but some soaking is necessary to produce the full effect, which seems to be reached in a half to one hour. At Academy Bay, a very large tide pool, of perhaps 25 by 100 feet, and from a foot deep at its margins to three feet deep at its center, was poisoned with less than two pounds of derris. This was far too weak a dose, and some fishes were still alive three hours later, but probably nine-tenths of the individual fishes were killed. Over a thousand fishes were taken from this one pool, and thousands more were discarded for lack of containers and preservative.

In the Galapagos pools, the Pomacentrids were the first fishes to be affected and killed, while some of the gobies and Eleotrids, notably *Bathygobius* and *Eleotrica,* resisted all but very strong derris. The fishes that habitually hide under stones, such as *Ogilbia,* and especially those that make burrows beneath large rocks (*e.g.,* certain Ophichthyid eels), take some time to come out, probably merely because the derris does not reach them at once. Some fishes float when killed, others sink. The two tiny, brilliant, banded gobies described by Snodgrass and Heller as *Gobius rhizophora* and *Gobius gilberti,* form cases in point. The former, much

the commoner, floats, the latter sinks and is hard to locate. A fine-meshed dipnet is always a necessity for securing fishes that sink or for catching those that would otherwise make off to hide and die in holes among rocks. Finally, some blennies often leave the water at the first whiff of poison, and skip over the rocks to other pools.

Although derris is used most effectively in pools, the senior author also used it with considerable effect on open rocky coasts where the surf was not great. While large quantities must be used, and the effect is soon dissipated by surging waves, many fishes will become more or less affected and can be caught with the dipnet before they escape or are carried away. Dr. L. P. Schultz and Dr. W. M. Chapman have recently used derris in large quantity and with great effectiveness upon the coral reefs of the central Pacific. As they have explained it to the senior author, liquid derris-mud was carried out to near the outer edge of the reef in large containers, at low tide, and was poured liberally along a section of the reef during the intervals between the breaking of the waves. The waves not only wash the solution over the surface of the reef towards the shore, but also carry dead and dying fishes shoreward. For operations as extensive as these, large quantities of derris powder must be taken to the field by the collector, in tight 25 or 50-gallon steel drums; the drums may then be used to preserve and pack the formalin-preserved fishes for shipment home. This type of collecting is expensive so far as the derris is concerned, but results in collections of such completeness and magnificence as to make previously used methods of obtaining the smaller shore or reef fishes seem a pure waste of valuable time. This is true especially when the ichthyologist goes on a long journey to reach his collecting locality. The cost of the derris is small compared to traveling expenses. Naturally, preservative and containers commensurate with the amount of derris to be used must be at hand. If proper care is used in selection of collecting places, at least one gallon of container space should be allowed for the preserved, wrapped, and packed smaller fishes resulting from the use of every pound of derris dust expended. It is possible that the rotenone extract now supplied commercially would greatly reduce the bulk of poison the collector must take with him, but we know of no one who has used it in ichthyological collecting.

Commercial rotenone fish poisons may also be used with great effect in fresh-water fish collecting. Their effect (using the fresh poison) has already been described by Eigenmann (1912, pp. 30-58) and by Eigenmann and Allen (1942, pp. 28-32). Eigenmann's account of taking 60 species of small fishes in an insignificant trickle of water on Gluck Island,

British Guiana, with native *hiari* poison, is a compelling illustration, not only of the previously unsuspected richness of a great tropical fresh-water fish fauna, but also of the comparative ineffectiveness of other types of collecting. When similar methods have been used in a number of selected small streams in tropical Africa, Asia, and the Malay Archipelago, we shall for the first time begin to know the real extent of the fish faunas of those areas. The senior author has used commercial *timbó* in South American streams with results comparable to those of Eigenmann. The liquid-mud solution is poured into a small brook one-half kilometer or more above the place where a fine meshed minnow seine is staked across the stream, care being used to select a good location where fish habitats of as many types as possible occur (riffles, holes, gravel or stone bottom, weeds, deep pools). The bottom of the net must be sunk into the gravel or held down by stones, so that no fishes can escape beneath it. The amount of poison used depends entirely upon the current and size of the stream, and must be determined by experiment. Two pounds of dust suffices for the average lowland brook of medium flow and size (5 to 15 feet in width and 6 inches to 3 feet depth). A man must be present at the seine and another must patrol the banks and pools, armed with a long-handled fine-meshed dipnet, to catch fishes not carried downstream and to watch for the tiny species which are often not over an inch in length when adult. Fishing must be carried on as long as dead fishes continue to appear (2 to 4 hours). Dr. Hubbs has used derris successfully on open lake shores where snags make seining impossible, by surrounding an area with a long seine and mixing poison into the enclosed area. Vestal (1942) has described the poisoning of an entire lake in the mountains of California (an occasion at which the senior author was present), when it was considered desirable to remove all the existing fishes before introducing certain game species.

Naturally, fish poisons, even those not dangerous to man or domestic animals, should be used with circumspection and with due regard to local laws, many of which forbid the use of any fish poison. In many places, the rarity or restricted range of certain species may contra-indicate the use of such wholesale collecting methods. However, in great tropical river systems, or on the open shores of the ocean, the occasional poisoning of a restricted area by an ichthyologist will seldom have any effect on the fauna as a whole, and the scientific results far outweigh the dangers.

Family Dactyloscopidae

Artificial Key to the Known Genera

1a. Dorsal fin continuous.
  2a. Dorsal origin on nape . . . . . *Dactyloscopus* Gill
  2b. Dorsal origin far behind nape, over or behind anal opening.
    3a. Head cuboid, bluntly truncated anteriorly; mouth vertical . . . . . *Dactylagnus* Gill
    3b. Head elongate, acutely conical; mouth moderately oblique . . . . . *Myxodagnus* Gill
1b. Dorsal fin divided, anterior three or four spines separated from rest of fin.
    4a. Total number of dorsal spines XXII; dorsal rays 19 to 20; abdomen scaled over ventral mid-line before vent; two anterior dorsal spines widely separated from the other dorsal spines; head conical; snout sharp and pointed; arched part of lateral line short . . . . *Heteristius,* new genus
    4b. Total number of dorsal spines X to XIV; dorsal rays 26 to 31; abdomen naked along ventral mid-line before vent; dorsal spines evenly spaced.
      5a. Arched and median portions of lateral line about equal; a separate anterior dorsal of three spines, first spine highest, second and third spines shortened; labial fringe absent on upper lip, little evident on lower lip . . *Gillellus* Gilbert
      5b. Arched portion of lateral line much shorter than median portion; a separate anterior dorsal of four short, well-separated spines; labial fringe present on both lips . . . . . *Cokeridia* Meek and Hildebrand

The Dactyloscopids form a small family of American marine shore fishes. They closely resemble certain more or less distantly related Australian fishes, such as *Crapatalus*. The southernmost species, *Gillellus australis* Fowler and Bean (1923, p. 23), is said to be from Valparaiso, Chile,[2] although the family is primarily tropical in habitat. Most of the species were described by T. N. Gill or C. H. Gilbert, and no modern monograph of the group has appeared. The majority of the known forms are, however, treated by Jordan and Evermann (1898, pp. 2297-2305) or

[2] This locality record needs confirmation. The species is known only from the types collected by the United States Exploring Expedition over 100 years ago, and the subsequent history of the fish collection made by this expedition lays any unusual record based on it open to suspicion.

by Meek and Hildebrand (1928, pp. 902-906), and are listed by Jordan, Evermann, & Clark (1930). Species that are not referred to in these three papers are the following:

Dactyloscopus crossotus Starks (1913). Natal, Brazil.

Gillellus australis Fowler and Bean (1923). Valparaiso, Chile.

Gillellus rubellulus Kendall and Radcliffe (1912). Galapagos Islands.

Gillellus rubrocinctus Longley (1934). Tortugas, Florida.

Gillellus quadrocinctus Beebe and Hollister (1935). Grenadines, British West Indies.

Cokeridia fimbriata Reid (1935).

Myxodagnus macrognathus Hildebrand (1936). Lobos de Tierra, Peru.

Dactyloscopus elongatus, new species

Plate 20, fig. 1

Holotype.—AHF no. 907.

Type locality.—Station 763-38, off Black Rock, south of Cape Corrientes, Jalisco, Mexico (19° 57′N, 105° 32′W), dredged in 5-10 fms, broken shell and sand bottom, January 7, 1938. Only the type known.

Measurements of holotype in mm.—Standard length (to tip of upper jaw) 35, depth 4.5, head 7.9, maxillary 2.8, eye 0.9, snout 0.9, interorbital 0.5, predorsal length 5.8, preanal length 9.

Description.—Body elongate, slender, somewhat rounded anteriorly, becoming compressed posteriorly, tapering gradually from greatest depth (through pectoral base) to base of caudal fin, the greatest depth 7.8 in standard length.

Dorsal X, 35, continuous; origin above upper edge of preopercle. Membranes of anterior dorsal spines deeply incised, barely reaching base of following spine. Dorsal rays more elevated than spines, posterior ray not joined by membrane to caudal base. Predorsal length 6 in standard length. Anal II, 39, origin under fifth dorsal spine, similar to soft dorsal. Preanal length 3.89 in standard length. Pectoral rays 13. Ventrals I, 3, inserted slightly before dorsal origin. Caudal fin with 10 articulated rays, distal edge rounded.

Scales cycloid, 53 in a lateral series. One and one-half scale rows between arch of lateral line and dorsal base. Five scale rows between lateral line and dorsal base at mid-length of body; four scale rows from the same point to anal base. Scales absent on head, abdomen, fins, and

from body immediately behind pectoral base. Lateral line complete, arched anteriorly for 12 scales, thence descending abruptly to mid-line of sides and continuing to caudal base.

Head moderate, cuboid, somewhat compressed, 4.4 in standard length. Dorsal outline flattened, curved slightly downward to tip of snout. Ventral outline of head curved steeply upward to tip of subsymphysial region. Lower jaw heavy, subsymphysial region projecting beyond mouth, forming a broad angle anteriorly. Mouth steeply oblique, almost vertical. Gape moderate, end of maxillary reaching to slightly behind posterior edge of eye, 2.9 in head. Lips fringed with small, close-set fimbriae. Eyes small, superior, 8.8 in head, placed on the outer ends of short, retractile stalks. Interorbital narrow, 16 in head. Snout short and blunt, 8.8 in head, equal to eye. Jaw teeth in narrow villiform bands of small, pointed teeth. No teeth on vomer or palatines. Nostrils paired; anterior nostrils tubular, placed anteriorly on snout just behind edge of upper lip. Opercular fringe of 13 fimbriae. Subopercular and interopercular membranes wide, flexible, and partially striated, covering throat and bases of pectoral and ventral fins. Gills 4, a small pore behind last gill-arch. Gill-rakers absent, slight granulations evident on first gill-arch. Branchiostegal rays 6. Pseudobranchiae absent.

Body color in alcohol light tan, with three darker lateral bands. The upper band at the base of the dorsal fin, the second band along the mid-line of the sides, and the lower band at the base of the anal fin. Head of same color as body, overlaid dorsally with a brown, reticulated pattern. Subsymphysial region with small, scattered, brownish punctations. Fins pale.

Comparisons.—Dactyloscopus elongatus differs from the other species of this genus, with the exception of *D. zelotes,* in the increased number of dorsal and anal rays. From *D. zelotes* it may be distinguished by the greater number of dorsal spines, smaller scales, more slender body, and different color pattern. This new species has fewer dorsal spines, smaller scales, more anteriorly inserted dorsal and anal fins, and a different color pattern than *D. pectoralis,* and may be distinguished from *D. lunaticus* by its smaller scales, fewer opercular filaments, and differently arranged mandibular teeth.

Myxodagnus sagitta, new species [3]
Plate 20, fig. 2

Holotype.—AHF no. 908.

Type locality.—Station 807-38, Academy Bay, Indefatigable Island, Galapagos, dredged in 10-25 fms, January 24, 1938. Only the type known.

Measurements of holotype in mm.—Standard length (to tip of upper jaw) 34, depth 4.25, head length (including lower jaw) 8.1, head length (without lower jaw) 7.5, eye 1.3, snout 1.5, maxillary 1.5, pectoral length 11.5, ventral length 3, caudal 5.1, predorsal length 8, preanal length 8.

Description.—Body elongate, somewhat rounded anteriorly, becoming moderately compressed posteriorly and tapering gradually to caudal base. Greatest depth (behind pectoral base) 8 in standard length.

Dorsal fin XI, 27, origin slightly behind vent, over first anal spine; fin low and continuous, last ray not joined by membrane to caudal base. Predorsal length 4.25 in standard length. Anal fin II, 35, similar to dorsal but higher. Preanal length 4.25 in standard length. Caudal fin rounded, with 10 articulated rays, its length 1.47 in head. Pectoral rays 13, fin elongate and pointed, tip of longest ray extending one-half the length of fin behind curve of lateral line, to above eleventh anal ray. Head 1.35 in pectoral length. Ventral fins I, 3, inserted below vertical edge of preopercle, 2.5 in head, end of fin almost reaching vent.

Head elongate, acutely conical, 4.5 in standard length. Dorsal profile almost straight, curved slightly downward to tip of snout. Ventral profile curved steeply upward from ventral insertion to tip of snout. Lower jaw strongly projecting, a fleshy flap or papilla at symphysis. Mouth oblique, superior; end of maxillary extending slightly past anterior edge of eye, its length 5 in head. Edge of lower lip fringed with numerous, large fimbriae; upper lip without fringe. Teeth in jaws in narrow bands of small, pointed teeth; vomerine and palatine teeth absent. Nostrils paired, anterior nostrils tubular. Eyes moderate, superior, 6.22 in head. Interorbital narrow, reduced to a narrow septum between the eyes. Snout bluntly rounded anteriorly, slightly longer than eye, 5.4 in head including lower jaw.

[3] While our paper was in proof, Dr. Hildebrand's *A descriptive catalog of the shore fishes of Peru* (1946, U.S. Nat. Mus., Bull. 189) appeared. On p. 408 he describes a new species, *Myxodagnus macrognathus,* from Lobos de Tierra, Peru. This is close to our new species, but appears to differ from *sagitta* in the fringed upper lip, the much shorter pectoral fins, the smaller eye, the differently shaped mouth, and perhaps other characters.

Scales cycloid, 50 in a lateral series. One scale row above arch of lateral line, 8 rows below. Four scale rows between median portion of lateral line and dorsal base at middle of body length, and 3 scale rows between lateral line and anal base at the same point. Scales absent on head and abdomen. Lateral line complete, arched anteriorly for 12 scales, thence descending abruptly to mid-line of sides, and continuing to caudal base. Membrane of subopercle and interopercle expanded into a thin membrane covering the throat and the pectoral and ventral bases. Opercular fringe of 5 small fimbriae. Gill-rakers absent. Pseudobranchiae well developed.

Color in alcohol light tan, with small, faint, brown markings along bases of dorsal rays. Edges of a few lateral scales with small, dark punctations. A small dark spot on mid-line of nape. Head same color as body. Fins pale.

Comparison.—Myxodagnus sagitta differs from the only other known species of this genus, *M. opercularis,* in having smaller scales, fewer scales above and below the lateral line, longer pectoral fins, fewer fimbriae in the opercular fringe, a more slender body, a longer head, and a posteriorly inserted dorsal fin.

Genus **HETERISTIUS,** new genus

Genotype.—Heteristius jalisconis, new species.

Body elongate, somewhat rounded anteriorly, becoming compressed posteriorly. Greatest depth through pectoral base, the body tapering gradually to caudal base. Head bluntly conical, not abruptly truncated anteriorly. Mouth moderately oblique. Lips fringed with small fimbriae, the fringe of the lower lip better developed than that of the upper. Lower jaw slightly projecting, without fimbria or flap of skin at its symphysis. Eyes superior, interorbital narrow. Narrow bands of small, pointed teeth in the jaws; vomerine and palatine teeth absent. Pseudobranchiae present.

Scales cycloid. Body entirely scaled, including abdomen, sides of body behind pectoral base, and the area from above arch of lateral line to upper edge of opercle. Head and fins naked. Lateral line present, complete; arched anteriorly for about 19 scales, the length of the arch about one-half that of median portion.

Dorsal fin elongate, II-I-XIX or VIII, 19 or 20, its origin above vertical limb of preopercle. First two spines close-set, united by deeply incised membrane. Third spine short and blunt, free, placed in center of wide interspace between the two anterior spines and the continuous

dorsal. Membranes of continuous dorsal deeply incised anteriorly. Soft dorsal higher than the spines. Anal fin long, continuous, its origin beneath third spine of continuous dorsal.

Although *Heteristius* somewhat resembles both *Gillellus* and *Cokeridia,* it may be separated from those genera by the greatly increased number of dorsal spines, by the fewer dorsal rays, by having the abdomen scaled across ventral mid-line before vent, and by the manner in which the anterior dorsal spines are separated from the continuous dorsal fin. In addition, this genus may be distinguished from *Gillellus* by the much shorter arch of the lateral line and the greater development of the labial fringe, especially on the upper lip. From *Cokeridia* (see Meek and Hildebrand, 1928, p. 905; and Reid, 1935, p. 163) it differs also in the much more conical head, in the more nearly horizontal mouth, and in not having eyes placed on the ends of short, retractile eye stalks.

Heteristius jalisconis, new species
Plate 21, fig. 4

Holotype.—AHF no. 914.

Type locality.—Station 763-38, off Black Rock, south of Cape Corrientes, Jalisco, Mexico (19° 57′N, 105° 32′W), dredged in 5 to 10 fms, sand and broken shell bottom, January 7, 1938.

Paratypes.—AHF no. 915. Station 765-38, 3 specimens, 30.5 to 36 mm, Chacahua Bay, Oaxaca, Mexico, dredged in 5 to 10 fms on sand and shell bottom, January 9, 1938; one of these now in the Stanford Natural History Museum.

Measurements of holotype in mm.—Standard length 40.5, depth 7, head 10, head width 7.5, eye 2, snout 1.9, maxillary 4, interorbital 0.85, predorsal 8, preanal 13.5.

Description.—Posterior dorsal ray not joined by membrane to caudal base. Predorsal length 4.88 to 5.1 in standard length. Anal fin II, 34 or 35, origin under third spine of continuous dorsal. Similar to dorsal, last ray not joined by membrane to caudal base. Preanal length 2.9 to 3 in standard length. Caudal fin rounded, with 14 articulated rays. Pectoral rays 13, middle rays longest, extending backward to beneath twelfth or thirteenth spine of continuous dorsal. Ventral fins I, 3, inserted beneath first two dorsal spines. Membrane of subopercle and interopercle expanded and covering throat, and bases of pectoral and ventral fins.

Scales 50-52 in a lateral series. Body entirely scaled, scales absent on head and fins. Abdomen scaled across ventral mid-line before anal

opening. Lateral line complete, arched anteriorly for about 19 scales, thence descending abruptly to mid-line of sides and continuing to caudal base. Two scale rows between anterior end of lateral line arch and dorsal base and one row posteriorly. Four scale rows above and below the straight portion of the lateral line at the beginning of the soft dorsal.

Head bluntly conical, 3.62 to 4.5 in standard length. Greatest width of head (behind eyes) 1.3 to 1.5 in its length. Dorsal outline of head descending gradually from nape to tip of snout in a long, flattened curve. Ventral outline of head curving steeply upward from ventral insertion to symphysis of lower jaw. Eyes moderate, superior, closely approximated, 5 to 6.1 in head; extending slightly beyond dorsal outline of head but not placed on the end of stalks. Interorbital reduced to a septum between the eyes, 2.3 to 3.5 in eye, 17.6 to 20 in head. Snout moderately pointed, not abruptly cut off or truncated anteriorly. Mouth oblique (20° to 30° from horizontal). Maxillary reaching to, or slightly past, posterior edge of eye, its length 2.5 to 2.75 in head. Premaxillaries slightly protractile. Lower jaw projecting, no papilla or flap of skin at symphysis of lower jaw. Fringe of upper lip developed anteriorly only, fringe of lower extending laterally to rictus. Branchiostegal rays 6. Gill-rakers absent.

Body color in alcohol a light yellowish buff with five irregular, darker transverse bars crossing the body. The first bar is immediately behind the base of the pectoral fin, the second under the thirteenth and fourteenth dorsal spines, the third at the mid-point of the body length, the fourth at the beginning of the posterior third of the body length, and the fifth under the posterior dorsal rays. A few, irregular, dark spots and blotches on the body between the crossbars. An elongate dark blotch at the base of the caudal fin. Head dorsally and laterally to below eye with irregular darker markings, becoming lighter ventrally. Fins and labial fringes pale.

Cokeridia lactea, new species

Plate 21, fig. 3

Holotype.—AHF no. 909.

Type locality.—Station 789-38, South Seymour Island, Galapagos, poisoned with derris root in tide pool, January 19, 1938, by G. S. Myers.

Paratypes.—AHF no. 910. Station 782-38, 1 specimen, 34.5 mm, Darwin Bay, Tower Island, Galapagos, poisoned with derris root in tide pool, January 16, 1938.—AHF no. 911. Station 784-38, 2 specimens, 22 and 31 mm, Darwin Bay, Tower Island, Galapagos, poisoned with

derris root in tide pool, January 17, 1938.—AHF no. 912. Station 789-38, 2 specimens, 38 and 38.2 mm, same data as holotype.—AHF no. 913. Station 800-38, 4 specimens, 34 to 38 mm, Cartago Bay, Albemarle Island, Galapagos, poisoned with derris root in tide pool, January 22, 1938.

Measurements of holotype in mm.—Standard length (to tip of upper jaw) 45.5, depth 9, head 12, eye 1.4, maxillary 5, snout 2, interorbital 1, predorsal length 9, preanal length 16.

Description.—Body elongate, rounded anteriorly, becoming compressed posteriorly and tapering gradually to caudal base. Greatest depth (behind pectoral base) 4.4 to 5.05 standard length.

Dorsal IV-VIII, 25 or 26, origin on nape over preopercular margin. Continuous dorsal preceded by four short, blunt, well-separated spines. Continuous dorsal of eight united spines and 25 or 26 articulated rays. Membranes of continuous dorsal spines incised, membrane of dorsal rays entire. Four anterior dorsal spines about one-half the height of united spines, which are less developed than dorsal rays. Posterior dorsal ray not joined by membrane to caudal base. Predorsal length 4.72 to 5 in standard length. Anal fin II, 27 or 28, similar to soft dorsal, origin under about fourth spine of continuous dorsal. Preanal length 2.83 to 2.84 in standard length. Caudal fin with 13 articulated rays, distal edge of fin rounded. Pectoral fin 13, fin broad and short, equal to head in length. Ventrals I, 3, inserted before pectoral base.

Scales cycloid, 42 or 43 in a lateral series. Scales absent on head, fins, abdomen, and sides of body immediately behind pectoral base. Scales absent between arched portion of lateral line and dorsal base. Three scale rows between dorsal (as well as anal) bases and the median portion of the lateral line at center of body length. Lateral line present, complete; origin at upper end of gill-opening, arched anteriorly for 12 or 13 scales, descending abruptly to mid-line of sides and continuing to caudal base.

Head moderate, slightly longer than deep, 3.63 to 3.79 in standard length. Dorsal outline of head almost horizontal. Ventral outline curved steeply upward from anterior edge of ventral base to tip of snout. Eyes small, superior, 8.5 to 9.3 in head; placed on the ends of short, retractile stalks. Interorbital narrow and concave, 12 to 13 in head. Dorsal aspect of head broad and flat, slightly convex posterior to eyes. Mouth almost vertical, lower jaw projecting beyond tip of snout. Lips fringed anteriorly, but not laterally. Maxillary reaching a vertical from posterior margin of eye (when retracted into head), 2.4 to 2.6 in head. Nostrils paired, anterior nostrils tubular. Snout short, 6 to 7.2 in head.

Teeth in jaws in narrow bands of very small, villiform teeth, teeth absent on vomer and palatines. Opercular fringe of 9 to 11 rays. Membrane of subopercle and interopercle expanded and covering throat and bases of pectoral and ventral fins. Branchiostegal rays 6. Pseudobranchiae present.

Body color in alcohol light tan; dorsally with six quadrate, dark brown spots lying close to dorsal base. A large, dark brown area on the mid-line of the nape before the dorsal fin. The lower edges of the dark, quadrate spots are united by a narrow, irregular, dark line, strong and sharply defined anteriorly, fading posteriorly, and entirely absent on some specimens. Several irregular, brown spots on side just behind and above pectoral base. Fins lighter than body. Head same color as body, a short thin dark line extending downward and backward from the lower edge of the orbit. Interorbital with a small, brown area between the eyes. In life milk-white, with fine, irregular, blackish marks.

Comparisons.—Two species of *Cokeridia* are known, *C. crossota,* the genotype (see Meek and Hildebrand, 1928, p. 905, pl. 89), and *C. fimbriata* (Reid, 1935, p. 163, fig. 1). The scales are smaller and there are more scales in a lateral series in *Cokeridia lactea* than in *C. crossota,* and *lactea* has a longer head, snout, and maxillary. There are fewer opercular fimbriae in *lactea,* the body is deeper, and the anal origin is farther back than in *crossota.* From *Cokeridia fimbriata* this species differs in having larger scales, fewer dorsal and anal rays, fewer fimbriae on the opercular fringe, no scales above the arch of the lateral line, and in many different proportions.

Notes.—This species is named from its milk-white color in life. It inhabits coarse, white, coral sand in shallow waters and tide pools in the Galapagos, and in these places is usually associated with another species of Dactyloscopid, *Gillellus rubellulus* Kendall and Radcliffe (1912, p. 148, pl. 6, fig. 3). The latter is usually the commoner. In life, these two species are so similar that it takes a sharp eye to distinguish them. The senior author first collected these fishes in the milk-white coral sand of the tide pools at Darwin Bay, while using derris. They were not seen at first, but the derris brought them out of the sand, in which they normally lie with only the tip of the snout, the nostrils, and the eyes protruding. It was noticed in the field that several of the individuals, out of some fifteen obtained that day, had stalked eyes, but it was not until the catch was sorted aboard ship in the afternoon, when the field preservative had already shrunk the eyes almost back into the retracted position, that the stalk-eyed fish were seen to be plainly different from the others.

C. lactea is a smaller, somewhat more delicate fish than *G. rubellulus*. Alive, the coloration of both is practically indentical, milk-white with traces of an incomplete dark, reticulated pattern. Upon fixation in an alcohol-formalin mixture, the colors and patterns of *lactea* do not at once notably change, but the eye stalks retract. On the other hand, the pattern of *rubellulus* changes almost immediately, by the appearance of the wide reddish, black edged bars, of which the only previous indications were traces of the dark edges, so indistinct that they appeared as a part of a poorly developed reticulation. Probably the two close relatives of *G. rubellulus* from the Atlantic that have a similar color and pattern also inhabit white coral sand. These are *G. rubrocinctus* Longley (1934, p. 257) and *G. quadrocinctus* Beebe and Hollister (1935, p. 222). The relationships of these three species of *Gillellus* are close and need elucidation.

Family Microdesmidae

This small family of blenniform fishes is known so far only from the coasts of tropical America and Cameroon. Three genera were recognized until recently, *Microdesmus, Cerdale,* and *Leptocerdale,* and the family appears in most ichthyological works under the name Cerdalidae. In a recent revision (1936), Reid has placed all the known species in a single genus, *Microdesmus,* of which the other two genera become synonyms. With the disappearance of the name *Cerdale,* the family name becomes Microdesmidae.

Reid has based his primary division of the species of *Microdesmus* on the position of the anus, which, in the known species, is placed either before or after the mid-point of the standard length. In our new species, and, indeed, in some of the others, the vent is so close to this mid-point that the value of the feature as a primary classificatory one becomes questionable. It seems possible that the restricted gill-openings of *ionthas* (the genotype of *Cerdale*) and *floridanus* may be of more importance in a phylogenetic system. If this be true, some authors may prefer to retain these two species in a separate genus, *Cerdale,* in which case the family name should revert to Cerdalidae.

Microdesmus reidi, new species

Plate 22, figs. 5, 6

Holotype.—AHF no. 916.

Type locality.—Station 784-38, Darwin Bay, Tower Island, Galapagos, poisoned with derris root in tide pool, January 17, 1938, by G. S. Myers.

Measurements of holotype in mm.—Standard length 67.5, depth 4, head 7, predorsal length 11.5, preanal length 33, anal opening to caudal base 34.5, preventral length 7, ventral base to anal opening 25.6, snout 1.2, eye 0.6.

Description.—Body elongate, compressed, especially posteriorly, depth 16.9 in standard length. Tail slightly longer than head and trunk, 1.95 in standard length. Body nearly equal in depth anteriorly, tapering slightly toward caudal base from anal opening.

Head short, 9.64 in standard length. Dorsal and ventral outlines almost evenly rounded anteriorly. Mouth small, oblique (45° from horizontal), reaching to beneath edge of eye. Lower jaw projecting; lips fleshy, with lateral membranous flanges, free edges of the flanges confined to sides of the mouth. Eyes small, lateral, high on head, 11.6 in head. Interorbital narrow, wider than eye, 7 in head. Nostrils paired, anterior nostrils tubular, placed close to the tip of the snout. Posterior nostrils larger, in front of and slightly above the eye. Teeth small, even, slightly flattened, in two irregular rows in the jaws. Teeth absent on vomer and palatines. Gill-openings restricted to sides, extending downward and forward from slightly below upper edge of pectoral base to slightly below and anterior to lowest pectoral ray.

Dorsal 51, long and low, no marked differentiation between spines and rays, its origin slightly behind tip of pectoral fin. Predorsal length 5.86 in standard length. Last dorsal ray joined by membrane to caudal base. Anal fin 33, similar to dorsal, its last ray also joined to the caudal. Origin of anal slightly behind mid-point of standard length. Preanal length 2.04 in standard length. Pectoral fin 12, edge of fin rounded. Caudal fin rounded. Ventral fin I, 3, inserted beneath gill-openings. Ventral spine minute, lying close to base of first ray. Preventral length 9.64 in standard length. Ventral base to anal opening 2.64 in standard length. Body and head, except for snout and sides of lower jaw, covered with minute, imbedded, nonimbricated scales.

Color in alcohol light brown dorsally to mid-line of sides, becoming rather abruptly lighter ventrally. Head dorsally a continuation of body color, becoming lighter toward tip of snout. All fins pale.

Comparison.—In Reid's synopsis of the genus and family (Reid, 1936), the new species falls almost midway between his two main divisions, which are based on the position of the vent, either anterior or posterior to the middle of the standard length. *M. reidi* actually has the vent very slightly nearer the tip of the snout than the caudal base. It appears to fall close to *hildebrandi* and *intermedius*. To judge from

Reid's figures, the pectoral fin of *reidi* is set lower than in those two species. Moreover, the dorsal origin in *reidi* is more posterior than in *intermedius* and the fin-ray counts differ sharply. On the other hand, *hildebrandi*, which seems closer to *reidi,* has a more slender form and a considerably shorter abdominal and longer tail region.

Microdesmus bilineatus (Clark, 1936, p. 394) from the Galapagos, was described too late to be mentioned in Reid's revision except in a footnote. It has D. 47 and A. 28, which counts seem to bring it near *reidi,* but the depth is 10.1 in standard length and the head 7. The gill opening is said to be "a small pore before base of pectorals." If this fish is a *Microdesmus,* it would appear to be similar to the short-bodied *ionthas,* and to have nothing to do with *reidi.*

Notes.—The unique type of *reidi* was obtained in a small, open, sandy tide pool not over a foot deep. The senior author had poisoned this pool and believed he had gotten all the fishes from it, at least all that had not been snatched up by his collecting companion—a fearless and persistent little Galapagos rail who closely followed the collector and the "poisoning" operations from pool to pool and derived great benefit from the resulting miraculous draught of fishes. However, upon finishing the work, a last look was given all the pools and this solitary *Microdesmus* was seen swimming rapidly about in one of them. The live fish was a clear, very translucent, yellowish gray, the only real color being the pink belly.

Our figure of this fish is not accurate in some details. The pelvics are under the gill-openings, not behind them; the number of fin rays is not quite accurate; and the apparent freedom of the anal from the caudal fin is an artifact caused by breakage of the fin. The general appearance is correctly portrayed.

We take great pleasure in dedicating this fish to Earl D. Reid, U. S. Marine Corps, retired, who has recently also retired from a subsequent long period of useful, conscientious, and interested service as Scientific Aid in the Division of Fishes of the U. S. National Museum. It is to him that we owe thanks for a very helpful revision of these small and obscure little fishes.

Family Antennariidae

Antennarius ziesenhennei, new species

Plate 23, fig. 7

Holotype.—AHF no. 917.

Type locality.—Station 796-38, Sulivan Bay, James Island, Galapagos, collected from a tide pool, January 21, 1938, by Fred Ziesenhenne.

Measurements of holotype in mm.—Standard length 79, greatest depth 25, head 17.5, eye 3, maxillary 10.6, snout 4, interorbital 6, length of first dorsal spine 7.8, length of second dorsal spine 6.5.

Description.—Body robust, squat, and fat, somewhat compressed posteriorly, wide anteriorly. Greatest depth (at base of third dorsal spine) 2 in standard length.

Dorsal III, 12: first spine (ilicium) slender, longer than second spine, its end (the "bait") expanded and divided into short fingerlike lobes. When depressed, the ilicium lies in a shallow groove around the right side of the base of the second spine. Second dorsal spine straight, conical, wholly free; lying in a shallow groove when depressed. Third dorsal spine entirely hidden beneath the skin, appearing as an obliquely pointed hump. Dorsal rays moderate, covered by heavy skin except at tips. Anal rays 7. Caudal 9, distal edge of fin rounded. Ventral fin with 5 short, flattened rays, inserted before pectoral base. Pectoral rays 10, placed at the outer end of a distinct wrist, pectoral (without wrist) 2.94 in head. Skin rough, thickly covered with small, bifid spines which, in their normal, mucus-covered state (as in our illustration) cannot be seen properly. Maxillary, mandible, and the grooves into which the first and second dorsal spines lie, when depressed, are naked.

Head short and blunt, 2.86 in standard length. Snout short and very blunt, 4.37 in head. Mouth vertical, lower jaw in advance of upper. Maxillary long, posterior and deeply covered by a fold of skin. End of maxillary extending backward almost to posterior margin of eye, 2.35 in head. Teeth small, pointed, in narrow bands in jaws and on palatines. Nostrils paired; anterior nostrils tubular, tube somewhat trumpet shaped. Posterior nostrils with raised rims. Eyes moderate, 5.8 in head.

The body color of the living fish was uniform grayish white, with a few, minute, widely scattered, blackish spots, the largest almost equal to pupil of eye. Fins of same color as body, slightly paler at tips of rays. The color has not changed appreciably in alcohol.

Comparisons.—The grayish white color distinguishes *A. ziesenhennei* from the other Eastern Pacific species, which are for the most part predominantly patterned in black, brown, or orange. The structure of the bait differs in this species, being composed of numerous fingerlike lobes

and not bifid as in *A. strigatus* or *sanguineus*. *Antennarius ziesenhennei* also differs from *A. strigatus* in having a much larger eye, shorter maxillary, and much shorter first dorsal spine. From *A. sanguineus* it differs in having a smaller eye, shorter maxillary, and longer first dorsal spine. Fowler (1938, pp. 248-261; and 1944, pp. 475-529) has given two lists which together mention most of the fishes of the Pacific coasts of tropical America, including the Antennariids. It is possible, of course, that *A. ziesenhennei* is closer to some of the central Pacific species, although we have not found it to be identical with any of them. While the number of nominal species of this genus has undoubtedly been too greatly multiplied, we do believe that many of them really represent distinct forms. The present seems to be one of these.

Note.—We are pleased to name this fish for Lt. Com. Fred Ziesenhenne, formerly of the Hancock Foundation, now of the U.S. Navy, who accompanied many of the Allan Hancock Expeditions and worked on the echinoderms obtained by them. He collected the type. Those who know him will perceive other reasons why we have named the fish for him.

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PLATE 20

Fig. 1. AHF 907. *Dactyloscopus elongatus,* holotype, x6.

Fig. 2. AHF 908. *Myxodagnus sagitta,* holotype, x6.

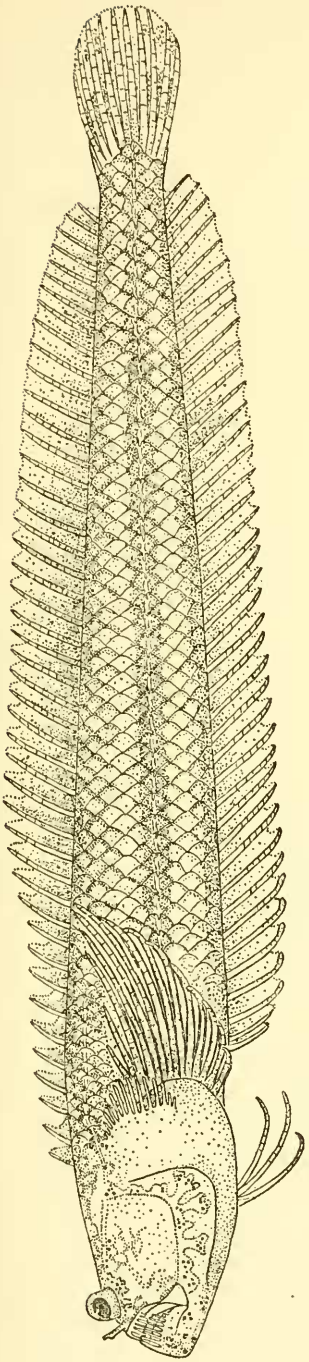


Fig. 1

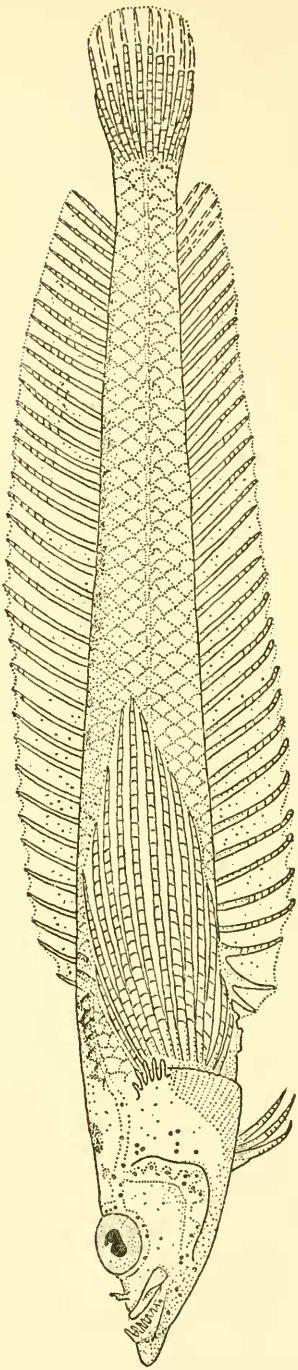


Fig. 2

PLATE 21

Fig. 3. AHF 909. *Cokeridia lactea,* holotype, x4.

Fig. 4. AHF 914. *Heteristius jalisconis,* holotype, x5.

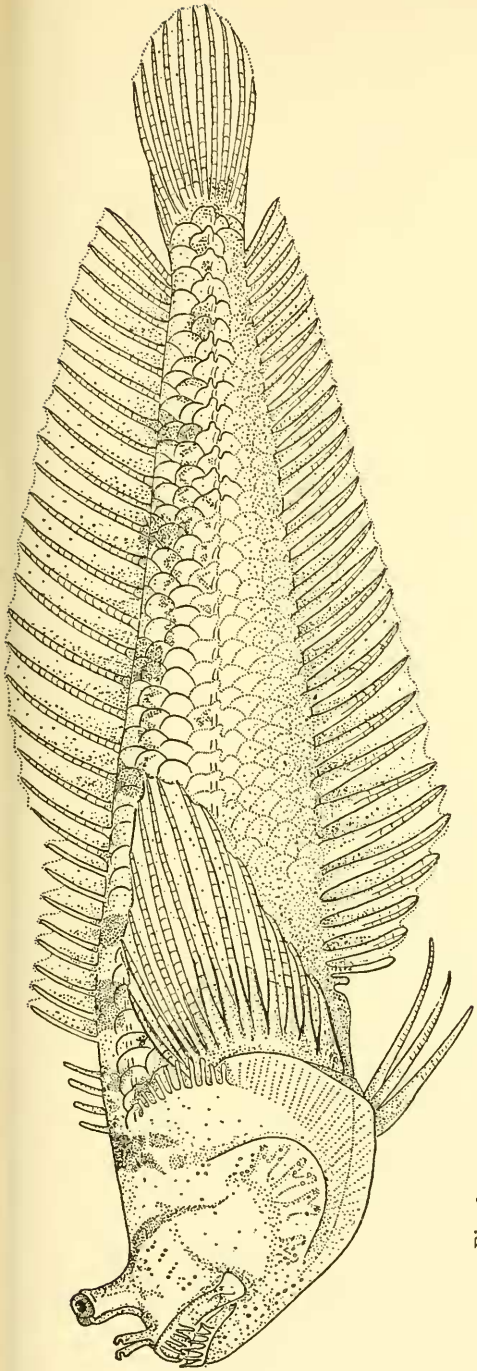


Fig. 3

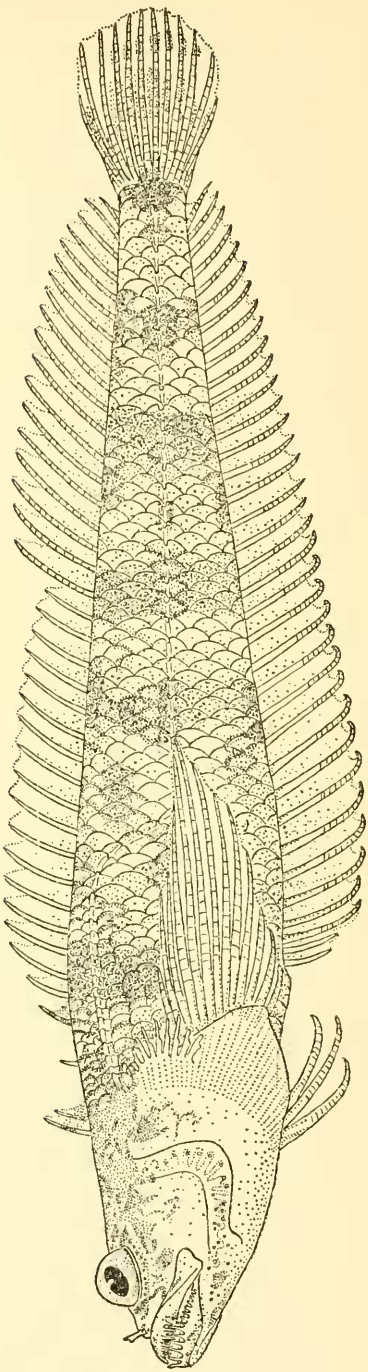


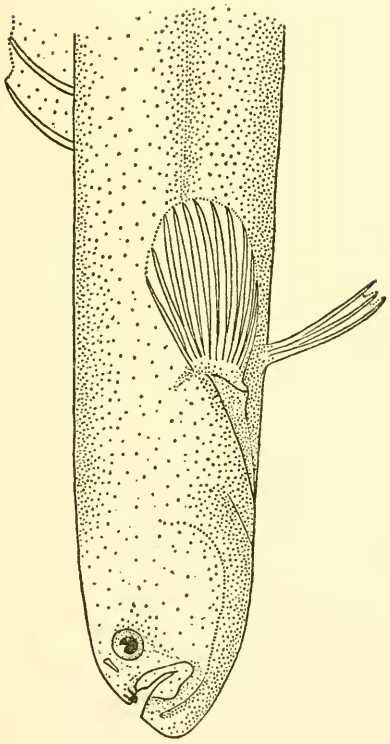
Fig. 4

PLATE 22

Fig. 5. AHF 916. *Microdesmus reidi,* holotype, x8, head and pectoral region.

Fig. 6. AHF 916. *Microdesmus reidi,* holotype, x3, lateral view.

Fig. 5



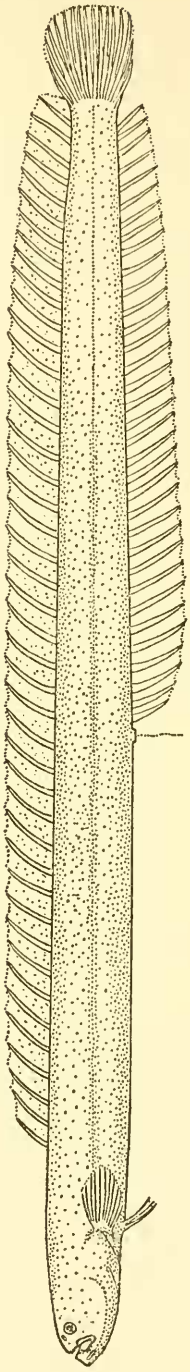


Fig. 6

PLATE 23

Fig. 7. AHF 917. *Antennarius ziesenhennei,* holotype, x3.